

VAPOR GROWTH METHOD FOR THIN SEMICONDUCTOR FILM

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Abstract

PURPOSE: To grow the titled thin film by adsorbing a group-III halide on a substrate crystal in an inert atmosphere, then absorbing a group-V element thereon in a reducing atmosphere, repeating the process, and controlling each growth layer at a high growth velocity.

CONSTITUTION: A reaction tube 1 consisting of the first chamber 12 and the second chamber 13 is provided with a substrate holder 15 to which an InP substrate 14, for example, is fixed and which can be inserted alternately into the two chambers through a bellows 19. A group-V halide (hereinafter referred to as PH₃) for the second chamber and H₂ as a reducing gas are charged into the second chamber 13 of the reaction tube, a group-III element 17 (hereinafter referred to as metallic In) put in a quartz dish is heated by a 2-zone furnace 16 to 650-900 deg.C, and the substrate 14 is heated to 500-800 deg.C. Then N₂ as an inert gas, PH₃, and HCl are introduced into the first chamber 12, the formed InCl₃ is adsorbed on the surface of the substrate 2, and then the substrate 2 is inserted into the second chamber 13 wherein PH₃ is adsorbed in the reducing atmosphere. Subsequently, the substrate 2 is inserted alternately into the first chamber 12 and the second chamber 13 to epitaxially grow each monoatomic layer. After a desired thickness is obtained, the substrate 2 is held in the second chamber 13 and cooled while protecting surface with PH₃.